

Application No.: 09/812065
Amendment dated: April 30, 2004
Reply to Office action of December 31, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS:

1(currently amended). A micro-analytical apparatus for mechanically manipulating fluid samples, comprising a substrate having at least a first and second covered ~~channel~~ with channels, each having openings at either end of said first and second covered channel opposite ends thereof, said first and second covered channels intersecting to form a common intersection with at least four arms, characterized in that wherein at least three of the openings ~~to~~ of said first and second covered channels are connected to a multi-port valve to control the pressure in the channels, said multi-port valve having at least eight ports; and said multi-port valve being the sole actuator controlling the direction of flow of fluid samples in all the arms of said intersection, and controlling the directions of flow in all of said arms simultaneously.

2(currently amended). The apparatus of claim 1, wherein the substrate is made of a substance selected from the ~~following materials group consisting of~~ glass, silicon, ceramics, organic polymers, metallic materials and mixtures thereof.

Application No.: 09/812065
Amendment dated: April 30, 2004
Reply to Office action of December 31, 2003

3(previously presented). The apparatus of claim 1, wherein the channels in the substrate are covered by lamination, thermal bonding, anodic bonding, electrostatic interaction, pressure or a combination thereof.

4(currently amended). The apparatus according to claim 1, wherein ~~all of~~ the openings at ~~either end~~ both ends of each of the first and second covered channels are connected to the multi-port valve.

5(previously presented). The apparatus according to claim 1, wherein the first or second covered channel contains a detection region.

6(previously presented). The apparatus according to claim 5, wherein the detection region consists of electrodes, or a window for spectroscopic detection.

7(previously presented). The apparatus according to claim 1, wherein the first or second covered channel is connected to a detection device.

8(currently amended). A method of manipulating fluid samples using the apparatus of ~~Claim~~ claim 1 comprising the steps of:

- a. mechanically pumping an eluent solution into one end of the first covered channel and through the intersection ~~whilst~~ while applying pressure to

Application No.: 09/812065
Amendment dated: April 30, 2004
Reply to Office action of December 31, 2003

- ~~either end~~ both ends of the second covered channel when the multi-port valve is in a first position;
- b. then switching the multi-port valve to a second position so that a sample solution is pumped into ~~one end of~~ the second covered channel ~~whilst~~ through an opening at one end thereof while pressure is applied at the other three openings; and
- c. switching the multi-port valve back to the first position so that the sample is pushed from one arm of the second channel of the device into the intersection and along the first covered channel.

9(currently amended). The method according to claim 8, wherein an electrical field is applied in a portion of said first or second covered channel in order to sustain or stop the flow of ~~liquid solution therein~~ during the ~~injection step~~ pushing of the sample along the first covered channel.

10(canceled).

11(currently amended). The method according to claim 8, wherein in ~~step 2(c)~~ step (c) the sample is pushed from one arm of the second covered channel of the device into the intersection and along the first covered channel by means of electrophoresis, ~~electro-osmosis or the like~~ or electro-osmosis.

12(previously presented). The method of claim 8, wherein at least part of the first or second covered channel

Application No.: 09/812065
Amendment dated: April 30, 2004
Reply to Office action of December 31, 2003

contains a stationary phase in order to perform chromatography, electrochemistry, electrophoresis, immunological or enzymatic analysis or any combination thereof.

13(new). The apparatus of claim 1, wherein said multi-port valve is switchable between:

- a first position, wherein the multi-port valve provides a path for mechanical pumping of a first fluid through said multi-port valve in said first covered channel, while the openings of said second covered channel are connected through said multi-port valve so as to form a closed loop; and

- a second position, wherein the openings of said first covered channel are connected through said multi-port valve so as to form a closed loop, while the multi-port valve provides a path for mechanical pumping of a second fluid through said multi-port valve in said second covered channel.

14(new). The apparatus of claim 1, wherein said multi-port valve is switchable between:

- a first position, wherein the multi-port valve provides a path for mechanical pumping of a first fluid through said multi-port valve in said first covered channel, while a first opening of said second covered channel is connected through said multi-port valve to mechanical pumping means and the second opening of said second covered channel is directly connected to

Application No.: 09/812065
Amendment dated: April 30, 2004
Reply to Office action of December 31, 2003

mechanical pumping means so as to pinch said first fluid sample at said common intersection; and
a second position where the openings of said first covered channel are connected through said multi-port valve so as to form a closed loop, while said first opening of said second covered channel is disconnected from any mechanical pumping means and the second opening of said second covered channel is directly connected to a mechanical pumping means so as to transport a second fluid in said second covered microchannel while maintaining constant pressure in both arms of said first channel.